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when taken from the water, a fact recently ascertained by Dr. Holbrook.

### Three hundred and thirty-sixth meeting.

August 14, 1850. — QUARTERLY MEETING.

The PRESIDENT in the chair.

The Corresponding Secretary read a letter of acknowledgment from Professor Karl Ritter of Berlin, in reply to a notification of his election as a Foreign Member of the Academy.

On motion of Mr. Treadwell, it was voted, that Jonathan P. Hall be appointed Meteorological Observer of the Academy on the Rumford foundation.

The nomination list was taken up, and the following gentlemen were elected Fellows of the Academy: —

Josiah.D. Whitney, United States Geologist.
Hon. John C. Fremont, of California.
Prof. Stephen Alexander, of Princeton, N. J.
Prof. J. S. Hubbard, of Washington, D. C.

On motion of Professor Peirce, it was voted, that the next statute meeting be held in the evening.

### Three hundred and thirty-seventh meeting.

October 1, 1850. — MONTHLY MEETING.

The PRESIDENT in the chair.

The Corresponding Secretary laid before the Academy letters from Professor Encke of Berlin, and Professor Müller, also of Berlin, signifying their acceptance of the honor conferred upon them by the Academy in electing them Foreign Honorary Members.

Professor Horsford presented a communication upon the spheroidal state of bodies. He proposed to show that temperature is not essential to the production of the phenomenon in some cases, and that no new law is required for its explanation in any case. He referred to the act of plunging the moistened hand into masses of molten metal as coming under this head, and as having been repeatedly performed in this country more than twenty years ago. The explanation he gave of the safety of the hand in this exposure was, that the moisture, volatilizing, rendered a part of the heat latent, and encased the hand in a sheath of aqueous vapor, so that only radiant heat acted upon it, and that only for the instant the hand was immersed.

As proof of the occurrence of the spheroidal state in the absence of temperature, Professor Horsford instanced the form mercury assumes on glass, that of oil and ether on water, and the bead upon acohol when agitated. The explosion at the close of the experiment of burning potassium or sodium on water, especially where the piece is large, he ascribed to the same cause as the explosion in the Leidenfrost experiment, where the cooling of the highly heated surface permits contact. The explosion attending the contact of fused saltpetre and water he classed with the Leidenfrost experiment. That which sometimes takes place when potassium is thrown into water or nitric acid, but an instant after the contact, he ascribed to another cause, — the mixture of hydrogen from the decomposed water, and oxygen from the air or acid, in such proportions as to be explosive.

Professor Horsford expressed a doubt whether any explosions of steam-boilers were to be ascribed to the Leidenfrost phenomenon, alleging that the temperature of 300°, which is about the temperature permitting contact, cannot produce sufficient steam from within the boiler to effect an explosion.

Professor Horsford concluded his paper with a series of experiments illustrating the general subject.

Professor Peirce stated that he had obtained from some investigations connected with the turbine wheel the following result: — that the curve along which a material point should move so as to compel this curve to raise weights to which it is attached, must be the cycloid. He exhibited a drawing of a bucket of a turbine wheel, constructed by Mr. U. A. Boyden, experiments upon which, conducted with the most scrupulous care, had shown it to produce an effect equal to eighty-eight per cent. of the power expended; and stated that some of Mr. Boyden's wheels had given the astonishing result of ninety-two per cent. of the power.

Professor Peirce made some remarks in regard to the fraction which expresses the law of vegetable growth, which he compared with the ratio of the mean motions of the planets, and found to express more nearly the arrangement of these bodies than Bode's law. For this purpose, Neptune's period of revolution must be multiplied by $\frac{1}{1} \times \frac{1}{2}$ to obtain that of Uranus. The period of Uranus must be multiplied by $\frac{1}{2} \times \frac{2}{3}$ to obtain that of Saturn. Saturn's period must be multiplied by $\frac{2}{3} \times \frac{3}{5}$ to obtain that of Jupiter, and so on. If this law is true, there can be only one planet within the orbit of Mercury, and no planet beyond Neptune. This law or harmony seems to be that to which successive development in general tends to conform, and is manifested when other forces opposed to it are not too powerful. The atomic laws are opposed to it, in crystallizing and other chemical processes; and also the higher laws of organization, such as those of bilateral division in the higher animals.

Professor Peirce remarked that the perturbative function of planetary motion had been developed by Hansen, according to the eccentric anomaly of one of the planets, in a numerical form; and exhibited the first terms of a literal development of this function, which is more simple than the usual form of development according to the mean anomaly. He thought there were reasons for believing that some other form of development will be discovered better adapted to cases of great inclinations and eccentricities; inasmuch as, in case the two orbits do not approach each other within a small distance, the development of this function should not contain any term capable of becoming infinite.

Dr. C. T. Jackson laid before the Academy a number of specimens of native phosphate of lime, or apatite, from a large vein discovered by Mr. Alger and himself in Hurdstown, New Jersey, during the month of June last, and offered the following remarks: —

"These specimens exhibit, in a striking manner, the various colors and forms of this interesting mineral, justifying the name given to it by mineralogists, in allusion to its deceptive appearance. Specimens of the crystallized mineral from Bolton, Massachusetts, St. Lawrence Co., New York, Murcia in Spain, and Hungary, were also shown, in illustration of its variable external appearance. The New Jersey specimens were crystallized, massive, and granular, and possessed various colors, such as olive-green, rosin-yellow, brown, and dingy white, and some of them were covered with iridescent films of oxide of iron. The peculiar resinous lustre of the broken surface may be pointed out as most generally characteristic of the mineral. By chemical tests its nature is readily proved, it being at once dissolved in nitric acid, and giving, when neutralized by ammonia, the characteristic yellow precipitate of phosphate of silver when tested with nitrate of silver. The presence of fluorine may also be demonstrated by decomposing the pulverized mineral by sulphuric acid, and allowing the fluohydric acid to act upon glass.

"Chlorine may be proved to be present by adding nitrate of silver to the nitric solution of the mineral. From these experiments, it appears that this mineral has the usual composition of apatite. Although crystals of this mineral have before been observed in the magnetic pyrites of this locality, the nature of the great vein of massive phosphate of lime had not been detected; its dead white appearance on the surface, and its structural changes into rhombic prisms of 80° and 120°, giving no idea of its true nature."

Dr. Jackson stated that he had advised Mr. Alger to obtain a lease of this locality, and to work the phosphate of lime for agricultural use, and that mining operations had since been begun, and thirteen tons of the mineral were now on their way to Boston, and would be converted into prepared phosphates.

He then spoke of the importance of augmenting the proportions of phosphates in our soils, and showed that they are essential to the healthy growth of both plants and animals. In reply to a remark of Dr. Holland of London, Dr. Jackson gave some account of the researches of Professor Daubeny of Oxford, England, who had been employed by the British government to investigate the economical value of the phosphate of lime of Estremadura, Spain. Prof. Daubeny found that the mineral phosphate of lime answered as well as bones in prepared phosphates for agriculture, but that the supply in Spain was too limited to be of much importance.

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### Three hundred and thirty-eighth meeting.

### November 5, 1850. — MONTHLY MEETING.

The PRESIDENT in the chair.

Professor Guyot, in behalf of the committee appointed to consider the expediency of recommending the adoption of the centigrade thermometrical scale, and the metrical barometrical scale, made a report, to which was appended a series of resolutions. A discussion of considerable length ensued, in which Messrs. Horsford, Lovering, B. A. Gould, Jr., Paine, Guyot, W. F. Channing, Peirce, Agassiz, Everett, and Treadwell took part; and the resolutions were amended and passed as follows: —

"1. *Resolved*, That the American Academy earnestly recommend the adoption of the metrical scale for the barometer destined for the observations made in behalf of the State of Massachusetts and of the Smithsonian Institution, not only for the sake of convenience, but also as a first step leading to a general adoption of the metrical system of weights and measures in scientific matters.

"2. As regards the thermometer, that the scale of Fahrenheit, in actual use in this country, be retained for the present.

"3. That a committee be appointed to consider the propriety and the practicability of introducing the modified Fahrenheit's scale mentioned in the report, or some other possessing similar advantages, as a universal scale, and to correspond with eminent meteorologists and scientific societies.

"4. That notice be given to the Smithsonian Institution of the opinion of the Academy on the subject of this report."

The Academy then